

**MATHEMATICS CROSSWALK
2008 DRAFT MATHEMATICS STANDARD TO 2003 MATHEMATICS STANDARD
COLLEGE AND WORK READINESS STANDARD**

MATHEMATICS STANDARD ARTICULATED BY GRADE LEVEL				
Strand 1: Number and Operations				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
1. Number Sense	1	<i>Solve problems and equations that require the number system to be extended from real to complex numbers.*</i>		
	2	<i>Determine when a solution to an equation is not a real number. *</i>		
	3	<i>Convert between radical and exponential forms of numerical expressions.*</i>		
2. Numerical Operations	1	<i>Perform computations with complex numbers.*</i>		
	2	<i>Explore different forms of complex numbers. *</i>		
	3	<i>Describe the relationship between real and complex numbers including plotting complex numbers as points in a plane. *</i>		
	4	Define polar coordinates; relate polar coordinates to Cartesian coordinates.*		
	5	Convert complex numbers to trigonometric form and then multiply the results.*		
	6	Apply DeMoivre's Theorem to calculate products and powers of complex numbers.*		

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Strand 1: Number and Operations				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
3. Estimation	1	<i>Recognize the limitations of estimations by assessing the amount of error resulting from estimation and determining whether the error is within acceptable tolerance limits.</i>	2	Determine if a solution to a problem is reasonable.

Strand 2: Data Analysis, Probability, and Discrete Mathematics				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
1. Data Analysis (Statistics)	1	Compute and explain summary statistics for distributions of data including measures of center and spread, including variance and standard deviation, with or without technology.	6	Identify which of the measures of central tendency is most appropriate in a given situation.
			10	Apply the concepts of mean, median, mode, range, and quartiles to summarize data sets.
	2	<i>Compare data sets using graphs and summary statistics, including variance and standard deviation, with or without technology. *</i>		
	3	Explain how sampling methods, bias, and the phrasing of questions asked during data collections impact the conclusions that can be drawn.	1	Formulate questions to collect data in contextual situations.
			12	Recognize and explain the impact of interpreting data (making inferences or drawing conclusions) from a biased sample.
			17	Identify differences between biased and unbiased samples.
	4	Identify misleading uses of data and explain how they are misleading.	5	Identify graphic misrepresentations and distortions of sets of data.

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Strand 2: Data Analysis, Probability, and Discrete Mathematics				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
1. Data Analysis (Statistics)	5	Explain the differences between randomized experiments and observational studies determining when it is appropriate to use each.*		
	6	Solve problems by estimating and computing with one-variable data using relative frequencies and two-variable data using two-way tables.*		
	7	<i>Draw a line of best fit for a scatter plot with or without technology; recognize that the correlation coefficient measures goodness of fit and explain when it is appropriate to use the regression equation to make predictions.</i>	7	Make reasonable predictions based upon linear patterns in data sets or scatter plots.
			13	Draw a line of best fit for a scatter plot.
	8	Determine when arguments based on data mistake correlation for causation.	11	Evaluate the reasonableness of conclusions drawn from data analysis.
2. Probability	1	<i>Apply probability concepts to calculate the probability of events and to make informed decisions in practical situations.</i>	1	Find the probability that a specific event will occur, with or without replacement.
			2	Determine simple probabilities related to geometric figures.
	2	Determine the conditional probability of an event given that another event occurs, decide if two events are dependent or independent, and determine the probability of an event given the probability of the complementary event.	1	Find the probability that a specific event will occur, with or without replacement.
			6	Distinguish between independent and dependent events.

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Strand 2: Data Analysis, Probability, and Discrete Mathematics				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
2. Probability	3	Estimate probabilities and predict outcomes using one- and two-variable data.	3	Predict the outcome of a grade-level appropriate probability experiment.
	4	Use the principal characteristics of the normal distribution to estimate probabilities.	MHS-S2C1-15	Identify a normal distribution.
	5	Distinguish between discrete and continuous probability distributions.*		
3. Discrete Mathematics – Systematic Listing and Counting	1	<i>Use the binomial theorem and Pascal's Triangle to solve problems.*</i>		
	2	<i>Explain the connections between binomial theorem and Pascal's triangle and probability.*</i>		

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Strand 2: Data Analysis, Probability, and Discrete Mathematics				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
4. Discrete Mathematics – Vertex-Edge Graphs	1	Understand, analyze, and apply vertex-edge graphs to model and solve problems related to paths, circuits, networks, and relationships among a finite number of elements, in real-world and abstract settings.*		
	2	Study the following topics related to vertex-edge graphs: Euler circuits, Hamilton circuits, the Travelling Salesperson Problem (TSP), minimum weight spanning trees, shortest paths, vertex coloring, and adjacency matrices.*		
	3	Devise, analyze, and apply algorithms for solving vertex-edge graph problems.*		
	4	Extend work with adjacency matrices for graphs, such as interpreting row sums and using the n th power of the adjacency matrix to count paths of length n in a graph.*		

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Strand 3: Patterns, Algebra, and Functions				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
1. Patterns	1	Apply recursion equations including equations which generate arithmetic and geometric sequences.	1	Communicate a grade-level appropriate iterative or recursive pattern, using symbols or numbers.
	2	<i>Use models and algebraic formulas to represent and analyze sequences and series:</i> <ul style="list-style-type: none"> <i>explicit formulas for nth terms,</i> <i>sums of finite arithmetic series, and</i> <i>sums of finite geometric series.</i> 	2	Find the n^{th} term of an iterative or recursive pattern.
	3	<i>Solve problems involving recursion.</i>	3	Evaluate problems using basic recursion formulas.
	4	<i>Use and interpret sigma notation to indicate summation.*</i>		
2. Functions and Relationships	1	<i>Express and solve problems that can be modeled using linear, quadratic, logarithmic, exponential, cubic, reciprocal, absolute value, and step and other piecewise-defined functions; interpret their solutions in terms of the context.</i>	3	Identify a graph that models a given real-world situation.
	2	<i>Graph polynomial functions identifying their key characteristics.*</i>		
	3	<i>Graph exponential functions identifying their key characteristics.*</i>		
	4	<i>Graph absolute value, and step and other piecewise-defined functions identifying their key characteristics.*</i>		

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Strand 3: Patterns, Algebra, and Functions				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
2. Functions and Relationships	5	<i>Identify whether a function has an inverse explaining why the graph of a function and its inverse are reflections of each other over the line $y = x$.*</i>		
	6	Solve problems by: <ul style="list-style-type: none"> relating logarithms and exponential functions as inverses, proving basic properties of a logarithm using properties of its inverse, and applying those properties to solve problems.* 		
	7	<i>Combine functions by composition, as well as by addition, subtraction, multiplication, and division including any necessary restrictions on the domain.*</i>		
	8	<i>Find domain, range, intercepts, zeros, asymptotes, and points of discontinuity of functions.</i>	5	Determine domain and range for a function.
	9	Find domain, range, intercepts, periods, amplitudes, and asymptotes of trigonometric functions.	5	Determine domain and range for a function.
	10	<i>Determine the key characteristics sketching the graphs of power functions in the form $f(x)=ax^n$, $a \neq 0$ for positive integral values of n.*</i>		

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Strand 3: Patterns, Algebra, and Functions				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
2. Functions and Relationships	11	<i>Determine if functions are even, odd, or neither both algebraically and graphically.*</i>		
	12	<i>Identify the degree of a given polynomial function and write a polynomial function of a given degree.*</i>		
	13	Use theorems of polynomial behavior (including but not limited to the Fundamental Theorem of Algebra, Remainder Theorem, the Rational Root Theorem, Descartes Rule of Signs, the Conjugate Root Theorem) to find the zeros of a polynomial function.*		
	14	Find approximate solutions for polynomial equations with or without graphing technology.*		
	15	Develop an informal notion of limits.*		
3. Algebraic Representations	1	<i>Apply the laws of exponents including rational and negative exponents to rewrite expressions in alternative forms.</i>	3	Multiply and divide monomial expressions with integral exponents.
	2	<i>Manipulate algebraic expressions describing the need for equivalent forms of the same expression.</i>	1	Evaluate algebraic expressions, including absolute value and square roots.
			2	Simplify algebraic expressions
	3	<i>Simplify radical expressions by performing operations on them.*</i>		
	4	<i>Solve systems of three linear equations in three variables with or without technology.*</i>		

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Strand 3: Patterns, Algebra, and Functions				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
3. Algebraic Representations	5	<i>Use matrices to represent everyday problems that involve systems of linear equations.*</i>		
	6	<i>Find complex solutions for quadratic equations.</i>	17	Solve quadratic equations.
	7	<i>Use matrix operations and the inverse of a matrix to solve problems.</i>	13	Add, subtract, and perform scalar multiplication with matrices.
	8	<i>Use matrices to organize and represent data.*</i>		
	9	Represent two dimensional vectors as matrices.*		
	10	Add, subtract, and compute the dot product of two-dimensional vectors; multiply a two-dimensional vector by a scalar.*		
	11	<i>Divide a polynomial by a lower degree polynomial.*</i>		
	12	<i>Describe the relationships among the solutions of an equation, the zeros of a function, the x-intercepts of a graph, and the factors of a polynomial expression with and without technology.*</i>		

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Strand 3: Patterns, Algebra, and Functions				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
4. Analysis of Change	1	<i>Analyze and describe how a change in an independent variable leads to a change in a dependent variable.*</i>		
	2	<i>Identify patterns in a function's rate of change identifying intervals of increase, decrease, constancy, and if possible, relate them to the function's verbal description or its graph.*</i>		
	3	<i>Analyze change in various contexts by modeling and solving word problems using functions and equations.*</i>		
	4	<i>Compare relative magnitudes of functions and their rates of change.*</i>		
	5	Solve problems involving compound interest.*		
	6	Demonstrate the relationship between: <ul style="list-style-type: none"> • simple interest and linear growth; and • compound interest and exponential growth.* 		
	7	Determine the total cost of purchasing consumer durables over time given different down payments, financing options, and fees.*		
	8	Apply a variety of strategies to use tax tables and determine, calculate, and complete yearly federal income tax.*		

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Strand 3: Patterns, Algebra, and Functions				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
4. Analysis of Change	9	Develop a personal budget including debit, checking, and savings accounts by interpreting multiple personal budget examples.*		
	10	Determine an effective retirement savings plan to meet personal financial goals including IRA's, ROTH accounts, and annuities.*		
	11	Compare and contrast the role of insurance as a device to mitigate risk and calculate expenses of various options.*		

Strand 4: Geometry and Measurement				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
1. Geometric Properties	1	Perform basic geometric constructions using a variety of methods (e.g., straightedge and compass, patty/tracing paper, or technology): <ul style="list-style-type: none"> perpendicular bisector of a line segment, bisector of an angle, and perpendicular or parallel lines. 	13	Construct a triangle congruent to a given triangle.
	2	Apply the law of cosines and the law of sines to find missing sides and angles of triangles.*		

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Strand 4: Geometry and Measurement				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
1. Geometric Properties	3	Use basic trigonometric identities including Pythagorean, reciprocal, half-angle and double-angle, and sum and difference formulas to solve equations and problems.*		
	4	Examine the application of multivariable equations to multiple dimensions including surfaces, cross-sections, and n -dimensional objects.*		
2. Transformation of Shapes	1	Describe how changing the parameters of a trigonometric function affects the shape and position of its graph ($f(x) = A \sin B(x-C)+D$ or the other trigonometric functions).*		
	2	<i>Describe the effect that changes in the parameters of a quadratic function have on the shape and position of its graph ($f(x) = a(x-h)^2+k$).*</i>		
	3	<i>Describe the effect that changes in the parameters of an exponential function have on the shape and position of its graph ($f(x) = ab^x$).*</i>		

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Strand 4: Geometry and Measurement				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
3. Coordinate Geometry	1	<i>Graph equations of ellipses and hyperbolas whose axes are parallel to the x-axis and y-axis describing the relationship between their algebraic form and their geometric characteristics.*</i>		
	2	<i>Graph the solution set of a system of two or three linear inequalities and given an ordered pair, determine whether it is a solution to the system.</i>	3	Graph a linear inequality in two variables.
	3	Graph all six trigonometric functions identifying their key characteristics.*		
	4	Evaluate all six trigonometric functions of angles between (0 degrees to 360 degrees, 0 to 2π radians) using the unit circle in the coordinate plane.*		
	5	Convert between rectangular and polar coordinates.*		
	6	Graph equations given in polar coordinates.*		
	7	<i>Determine an equation of a circle given its center and radius; given an equation of a circle, find its center and radius.*</i>		
4. Measurement	1	Explain, use, and convert between degree and radian measures for angles.*		

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Strand 5: Structure and Logic				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
1. Algorithms and Algorithmic Thinking	1	<i>Use a variety of approaches (inductive and deductive reasoning, estimations, generalizations, formal and informal methods of proof) to analyze algorithms.</i>	5	Determine the purpose of a simple mathematical algorithm.
			6	Determine whether given simple mathematical algorithms are equivalent.
2. Logic, Reasoning, Arguments, and Mathematical Proof	1	<i>Formulate and apply a strategy for solving problems.</i>	MHS-S1C2-01	Select the grade-level appropriate operation to solve word problems.
			MHS-S1C2-02	Solve word problems using grade-level appropriate operations and numbers.
			MHS-S1C3-01	Solve grade-level appropriate problems using estimation.
	2	<i>Use logical reasoning and mathematical knowledge to obtain and justify mathematically correct solutions.</i>	4	Analyze assertions related to a contextual situation by using principles of logic.
			6	Distinguish valid arguments from invalid arguments.

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Strand 5: Structure and Logic				
CONCEPT	2008 PO	ITEM DESCRIPTION	2003 PO	ITEM DESCRIPTION
2. Logic, Reasoning, Arguments, and Mathematical Proof	3	<i>Determine under what conditions a given statement (algebraic, geometric) is true.</i>	MHS-S4C1-02	Identify the hierarchy of quadrilaterals.
	4	<i>Use reasoning and proof to verify or refute conjectures and theorems:</i> <ul style="list-style-type: none"> <i>• verification or refutation of proposed proofs,</i> <i>• simple proofs involving congruent triangles, and</i> <i>• counterexamples to incorrect conjectures.</i> 	MHS-S4C1-11 MHS-S4C1-12 7 8 9 10	Determine when triangles are congruent by applying SSS, ASA, AAS, or SAS. Determine when triangles are similar by applying SAS, SSS, or AA similarity postulates. Create inductive and deductive arguments concerning geometric ideas and relationships, such as congruence, similarity, and the Pythagorean relationship. Critique inductive and deductive arguments concerning geometric ideas and relationships, such as congruence, similarity, and the Pythagorean relationship. Identify a counterexample for a given conjecture. Construct a counterexample to show that a given conjecture is false.

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